NEWSLETTER

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The Australian Society for Limnology is an association of over 400 people with professional or amateur interests related to Australian inland waters Since its inception in 1961 the Society has played an important role in fostering limnological work in this country. The ASL promotes liason between limnologists in academic, private and governmental institutions and has a vested interest in the conservation of aquatic and related resources. Annual conferences are held near centres of limnological interest, and the programme includes scientific sessions, field excursions and social activities.

The ASL produces a newsletter with notes on activities, articles of general interest, book reviews and conference announcements; a Bulletin of original scientific papers and occasional Special Publications. A further publication is the Directory of Australian Limnologists.

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Editorial

Many limnologists must have been as dismayed as I was at the composition of the Interim Council of the Institute of Freshwater Studies (listed on p.22). Indeed there is a growing feeling that limnology may have been substantially better off had the Fraser government been returned at the last election. The $400,000 allocated for aquatic research by the previous government, and on the point of being disbursed prior to the election has disappeared and instead of what appeared to be a likely substantial increase in funding for limnological research in 1983 we find ourselves blessed with yet another inquiry.

In spite of the fact that much of the scientific interest in Australian inland waters centres on our unique biota, in spite of the fact that most of the beneficial uses of inland waters are dependant on the biota, and in spite of the fact that many of the management problems with Australian inland waters are biological we have an Interim Committee established which has not one member with expertise in this field.

The Minister says that "the committee is not meant to be representative of all the disciplines and areas of concern which might be relevant to a consideration of inland water research priorities ". That may be true, but aquatic biology is not just relevant to inland water research, it is central. Without an aquatic biologist the Interim Committee is not unbalanced - it is crippled. Senator Walsh, in establishing such a committee calls his competance into doubt.

LIMNOLOGY: MICKEY MOUSE SUBJECT OR CINDERELLA SCIENCE - THE CONFESSIONS OF A DEVIANT LIMNOLOGIST

Presidential address to the 1983 Congress of the
Australian Society for Limnology

By

D.S. Mitchell
CSIRO Centre for Irrigation Research
GRIFFITH, New South Wales

I want to discuss 3 matters: recent developments in the organisation of water research in Australia, the lessons limnologists should draw from these, and a consideration of possible ways ahead.

1. Organisation of Water Research in Australia

When I first came to Australia in 1975/76 to study water weed problems I was impressed, or perhaps more accurately, unimpressed by the lack of a National Institute for Freshwater Research and I followed Hart (1974) and Wood (1975) in recommending to the Federal Government that such an Institute should be established (Mitchell, 1978). In this we were only echoing what other Australian limnologists had been advocating for some time and as you all know the Society has continued to emphasise the urgent need for such a development (as evidenced by a resolution to this effect at last year's Annual General Meeting).

Not surprisingly, there have also been a number of suggestions that CSIRO should establish a Division of Water Research (e.g. Australian Senate Standing Committee on National Resources, 1978). However, at Executive level, CSIRO has maintained the view that a single Division for water would not be an appropriate response to the wide ranging scientific fields that make up water research and prefer to sustain support for separate groups investigating different aspects of the water cycle. Unfortunately, aside from the work of John Kirk on light climate in water and some work on water weed ecology, there was no overtly limnological work amongst the Organisation's research programs. Indeed I was the first limnologist they appointed (as a hydrobiologist). However, water was identified as a priority research area in 1980 and, moving with

ponderous purpose and repeated hesitations (the simile of a chameleon comes to mind), the Organisation set up a committee to advise the Executive on water research needs and development. This Committee was galvanized into action with somewhat indecent haste by the presentation in 1981 of a private members bill in the Federal House of Assembly by Mr. Ralph Jacobi the ALP member for Hawker, S. Australia, proposing the establishment of a National Institute for Freshwater Studies. The AWRC similarly set up a working party to look at water research in Australia at about the same time.

All this activity in CSIRO resulted in the nomination of 3 priority areas for water research in that organisation: salinity and other water quality issues, catchment hydrology, and ground water. The clause, "other water quality issues" was added to "salinity" so as to include limnology after protests at the latter's omission. AWRC in its turn received a report from its working party (Water Research in Australia: new directions (Australian Water Resources Council, 1982) and decided to establish the National Water Research Council. Applications for research funds were called for and considered by the Council. However, before the Minister could approve the awards, there was a change of Government. The whole situation is now back in the melting pot because the newly elected Labour Government is required to consider the establishment of an Institute of Freshwater Studies in terms of the following item from their 1983 political platform.

"The 1982 ALP platform commits a Labour Government to the establishment of an Institute of Freshwater Studies to investigate water quality and as a matter of priority, to specifically advise on the equitable and effective management of the River Murray system as a national resource". (Item 46 (Page 144) 1982 ALP Platform Constitution and Rules).

2. Some Lessons

During the above events, I was attempting to present the need for, and importance of, limnological studies as strongly as I could. However, I soon became aware that limnology was a mystery to most people: even the alternative "ecology of inland waters" was not sufficiently explicit. More gradually, I also became uncomfortably aware of my own inability to project limnology convincingly as a science comparable to other sciences. You will know of Lord Rutherford's remark that physics is the only true science - the rest is stamp collecting; and, for many of my colleagues in CSIRO and for many of those who arbitrate in the awards of funds for research (predominately engineers so far as water research is concerned), limnology is "stamp collecting". To a large extent this is due to poor understanding of our science but I now realise that it

is also due to the nature of much current limnology in Australia. There is too little rigorous science employing classical scientific methodology and too much "survey" studies. There is too little carefully planned work that aims to extend the frontiers of our understanding and too much ad hoc, opportunistic data collecting which often turns out to be "more of the same". Also, unfortunatley, we have become associated in the minds of many with the applied disciplines of engineering and with politically active environmentalists. Obviously it is not as black and white as I have painted it, nor are these judgements entirely fair and it must be recognised that the careful collection of reliable biological chemical and physical data about our water bodies is the first step and, if information is to lead to better understanding, it is essential that hypotheses be formulated from the collected data and systematically tested.

Data collecting is relatively easy and now storage and manipulation of data is becoming easier all the time. Steiner (1971) wrote: - "in 1969, the information-handling capacity of computers - i.e. the number of units of information which can be received and stored - passed that of the 3.5 billion brains belonging to the human race. By 1975 computers will be leading by a fifty to one ratio. By whatever criterion used, size of memory, cost, speed and accuracy of calculation computers are now increasing a thousand-fold every fifteen years". But in contrast with the collection and storage of data, human capabilities for interpreting data and for arranging it in imaginative ways as well as for gaining insights from it which extend understanding have remained about the same: if anything the data overload has made the latter processes more difficult.

I am led to wonder if many limnologists are opting out of the struggle to extend understanding and instead find fulfilment in collecting more and better data, with the goal of seeking excellence in greater precision and at the same time obtaining enjoyment from "messing about in boats", as Toad in "Wind in the Willows" put it. To what extent do limnologists enhance their science by the quality and rigour of their research or to what extent do they indulge their own pleasures in a kind of mutual masturbation?

And yet good science is enjoyable. Indeed there is a direct relationship between the quality of the science that is done and the level to which the scientist has regarded it as a necessary means to obtain a salary or a chore to be done before he goes home at 4.45pm. Good scientists have enthusiasm and vitality and so does their science. Australian limnology is indeed fortunate in the number of its exponents who fit that description. Such people set the standard for the subject and, with their enthusiastic leadership, together with vision and rigorous scientific practice limnology has a bright future on this continent.

3. The Way Ahead

This brings me to the third section of what I want to say. "Where do we go from here?"

First, we must be clear about our aims and our specific needs. I suggest the following:

1. Clearly set out, concisely worded, well justified research programs of high quality;
2. More collaboration in planning and research - there is too much fragmentation in our own minds as well as in the minds of the scientific community so that limnology is divided up between disciplines and regions;
3. More employment opportunities (this will also raise morale);
4. More research resources in a very competitive world where the purse strings for research funds are closed as tight as a bull's bum in a hailstorm (simile used by kind permission of I. Campbell).

All this must have a cohesive framework and surely this is provided by the need to put the management and utilisation of our water resources on a firm scientific foundation. Yet our inland waters increasingly reveal evidence of the adverse consequences of their "development" for various forms of urban, industrial and agricultural use and the pressure for further development will become more intense.

We have to promote, co-ordinate and, where desirable, initiate strategic (mission-oriented) and tactical (applied) research relating to the management of environmental problems and the utilisation and conservation of inland water ecosystems - not only because this is needed but also because such research is the most likely to attract financial support. But basic research cannot be neglected and, by some means or other, must be included in these programs. This is particularly important as far as taxonomic research is concerned.

Research planning requires clear objectives. A recent review of research needs for inland water ecosystems in South Africa (Noble & Hemens, 1978) set out research objectives for that country. With relatively little modification, these are suitable as broad national objectives for limnological research in Australia as set out below.

(1) To develop the understanding necessary to predict the effects of natural events, planned development and management actions on inland water ecosystems.

(2) To form a scientific basis for conserving and/or utilising these systems e.g. as a water supply, for recreation, and for biological production.

(3) To seek solutions to particular environmental and management problems related to inland water ecosystems.

I am certain that the research programs necessary to achieve such objectives and the specific projects that would be required in them could be most readily and effectively formulated from within an Institute of Inland Water Studies with national responsibilities.

The folowing organisations are currently active or potentially active in limnological research in Australia:

Universities & Colleges of Advanced Education,

State Departments,

Urban Water Boards,

CSIRO

We are faced with the alternatives of:

(i) promoting one of these organisations,

(ii) formulating a collaborative arrangement between some or all of these organisations,

(iii) establishing a new institution.

If the first alternative is chosen, the only suitable existing organisation is, in my view, CSIRO: it is the only one with a national role and with the necessary infrastructure of libraries, workshops, buildings, and national administration. It is also the only organisation that is currently active in all States and Territories in Australia.

So there are really 3 options:

1. develop a substantial new limnological effort in CSIRO;

2. establish a new Institute which must have a clearly defined focus (at present both research and advisory functions are being advocated and achievement of the best results in each of these do not necessarily coincide);

3. promote collaborative endeavours between existing organisations.

Last year the Society passed a motion calling for the second option and the Executive distributed a press release to that effect. In the meanwhile I have taken the opportunity to develop possible concepts for the expansion of limnology in CSIRO. I believe that about 80 positions of all types would be needed: 40 in the Murray Catchment, say at Albury and Griffith; 20 in the tropical region; 20 in a tempertate region, say at Hobart. In addition 20 postgraduate fellowships should be awarded by CSIRO for limnological research at tertiary educational institutions throughout the country. These would have the effect of deregionalising research effort and promoting collaborative endeavours. The overall achievement of a development of such magnitude would take at least five years and may take ten. However, if the goal was set and vigorously pursued, I have no doubt it could be reached.

I believe the Society has to consider its current role. We must grasp the opportunities for promoting limnological research that are now being presented. Should we vigorously campaign as a Society with the political decision makers? If so how? Should we take an activist postion or lobby in the background? Should we conduct a public relations campaign ? Whatever we do, it must be done in concert and I wonder if there is a need for a workshop with a limited number of attendants to arrive at an agreed plan.

I have raised some uncomfortable questions. Yes, I am unhappy with the current situation but NO, I am not despondent. If this Conference is anything like the others I have attended you will hear accounts of limnological work that more than meets the strictest criteria for scientific excellence. While that continues to occur at these Conferences, I remain confident of the future for limnology in Australia.

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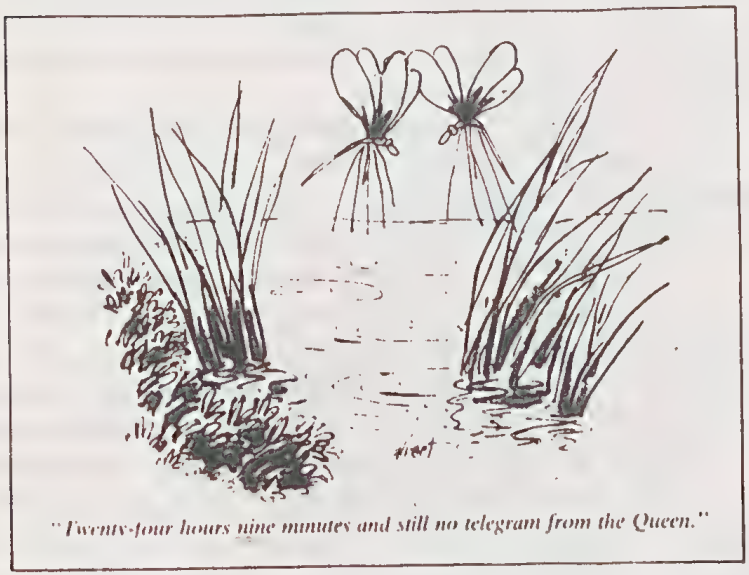
Australia Too

Readers of the ASL Newsletter may be amused by the following exchange of cables which took place on the day Australia II won the America's Cup:

> Williams (Adelaide) to Nelson Hairston (University of Rhode Island): "Sincere condolences. Red colour aquatic organisms clearly deleterious. Williams."
> (Note: Hairston, in a series of well-argued papers, has suggested that the red pigmentation of some planktonic crustaceans serves to protect them from light damage.)
>
> Hairston (University of Rhode Island) to Williams (Adelaide): "Congratulations. Unbeatable evolutionary novelty from down under. Keel with prepubic projections. Hairston."
> (Note: female marsupials are characterized by pubic projections which serve to support pouch.)



"Twenty-four hours nine minutes and still no telegram from the Queen."

AN ANECDOTAL ACCOUNT OF THE DISCOVERY (IN LARGE NUMBERS) OF THE MOST PRIMITIVE CHIRONOMID LARVA BY (WOULD YOU BELIEVE IT ?) A ZOOPLANKTONOLOGIST AN HIS MATES.

I.A.E. BAYLY

The saga started back in March or April 1975. I was concerned that Dillingham-Murphyore Minerals had already (but only recently) started operations on Sand Mining Lease 102 which ran from the coast right to the shores of Lake Boemingen. The latter has the distinction of being perched about 75 m above sea level and of being the largest lake (A = 260 ha) on Fraser Island. It was quoted in the Bayly-Williams book (1973) as being a fine example of dune "lakes resting on impervious organically bonded sand-rock in dune depressions". My concern was probably heightened by the fact that at the time I was Vice-President of the Australian Conservation Foundation.

At about this time my good friend and colleague Harry Burton of the Antartic Division suggested tha I go on a trip with him to Fraser Island. He said he had a friend Trevor Tierney (formerly medical officer with the Antartic Division) who lived in northern New South Wales and who was keen to visit Fraser Island and might be prevailed upon to provide his Land-Rover for the purpose. I jumped at the chance.

So it came to pass that on 4 May 1975, Bayly, Burton and Tierney crossed on a ferry from the mainland to Fraser Island together with a commandeered (in the interests of science!) Land-Rover. The early part of the trip was not uneventful. We tried to make an initial dash up to the east coast to the far north of the island, but in trying to "jump" the Rover over the Chard Rocks (just north of Happy Valley) at high tide we broke the longer of the two rear axles. We crawled back to Happy Valley where, as luck had it, we managed to secure a replacement axle from a local resident. Under the direction of Trevor and local resident, we succeeded after some hours in removing and replacing the offending axle, and we were again mobile. We then abandoned plans to go to the north and, after some quick sampling at Lake Coomboo, AB Lake, Boomerang Lake South and Lake Wabby, we decided for reasons given above to spend most of the time at Lake Boemingen. What, I asked myself, would be the most profitable aspect of the lake's biology to study in the very limited time at our disposal? I decided it was not the plankton, which I had already looked at in 1963 and

1972, but the fauna of the sand itself. Sand was what Fraser Island was made of, and here in Lake Boemingen we had its largest single volume of epigean fresh water and also the greatest area of accessible sand bathed in fresh water. (Most of the sand grains on Fraser Island that are surrounded by fresh water must be surrounded by inaccessible ground water. This must be a biotope with a huge aggregate volume as yet quite unstudied biologically).

I adopted a rather agricultural approach to the sampling problem; the collecting method adopted by Waders Bayly was (as you might expect) to wade out into water up to about 60 or 70 cm in depth armed with a shovel (none of this Eckman-Birge stuff favoured by the so-called sophisticated workers on benthos). So sand was shovelled from the shallows, placed in a large basin, covered with filtered water, and stirred vigorously by hand into suspension. Immediately after cessation of stirring the supernatant water and any temporarily suspended animals were quickly strained through a zooplankon net (I should like to point out that this is much more useul for collecting benthos than an Eckman-Birge grab is for collecting plankton!) suspended vertically. A macroscopic examination of the collections seemed to indicate the presence inter alia of reasonable numbers of chironomid larvae. But that had to wait. There was now more urgent work to be done. Having finished with Lake Boemingen we "raided" Dillingham-Murphyore's camp armed this time, not with shovels, but with cameras. I remember Trevor Tierney getting a rather terse reply (not printable here) when he asked one of the DM employees if he would position his vehicle in such a way that the DM insignia painted on the driver's door would appear in the photo he was about to take! Three of the photos I took appeared in Vol. 7, No. 5 (May 1975) of the A.C.F. Newletter.

At the end of 1975 I found time to start work in the laboratory sorting and counting the animals I had collected from the benthic region of Lake Boemingen. The numerically dominant component in my collections was what, to a simple-minded zooplanktonologist, looked like a rather strange chironomid larva. In fact I called it "Chironomid sp. 1" of which I had no fewer than 682 specimens. I sent these together with chironomid spp 2-4 to Jon Martin who had kindly identified the latter as Procladius, Polypedilum and Cryptochironomus, but thought that my "Chironomid sp.1" was possibly a ceratopogonid. So I then (January 1976) sent it to Prof. Kettle, University

of Queensland, but he disowned it as a ceratopogonid.

At that stage Tomi Petr had a room immediately adjacent to mine and was starting to take an active interest in the identification of Australian chironomid larvae so I showed my "Chironomid sp.1" to him. Tomi agreed that it was a chironomid but said it was quite aberrant in lacking a labial plate and he was unable to make any effective progress at keying it out at sub-family or generic level. So Tomi gave up and sent some specimens to his friend DR. E.J. Fittkau in Bavaria. That was in 1976. There the saga lay dormant for some six years during which time I became discouraged in my bid to publish a note on the sand fauna because of my inability to get identified the dominant component.

The whole issue sprang to life again for me when I received from Tomi Petr a letter dated 31 August 1982 and saying that Dr. Fittkau had identified my material as belonging to the sub-family Aphroteniinae so far known from adults only from South Africa, South America and Australia. I still do not know whether Dr. Fittkau had simply put my material aside for some years or whether he had worked on it intermittently before being able to assess its affinities. Anyway he wanted more details of locality etc. and I replied to him at length, this time directly. Dr. Fittkau replied to mine on 19 November 1982 saying that he had sent my larval material to Professor Lars Brundin who first erected the sub-family Aphroteniinae. I heard from Professor Brundin by 10 December 1982 saying that he had received some very interesting slide material from Dr. Fittkau (it would have beem originally mounted by Tomi), but that it was by now rather flattened and difficult to study and would I be able to send him some more specimens. I replied to the effect that I only had about 5-600 specimens left (all unmounted) and that if they were of any use to him he could certainly have them!

I have just received a letter from Professor Brundin dated 19 April 1983 saying that he had just finished drawing and described the Fraser Island larva together with a related one from southern Chile. He will be erecting a new genus and species for the Fraser Island animal and he commented in his letter that "This larva attracts special interest because it stands out as the most primitive chironomid larva yet known". He also commented that in certain aspects of its structure it is reminiscent of "the most primitive Diptera". Brundin was obviously surprised that the Fraser Island animal had

a lacustrine habitat because "All other species of Aphroteniinae seem to be typical inhabitants of mountain streams".

I propose to publish in the reasonably near future a rather more formal note than this on the nature of the sand fauna of Fraser Island as represented on the shores of its largest lake. In the meantime I will be quietly relaxing in the firm expectation and belief that shortly one of the hordes of people (there certainly seems to be hordes associated with Sam Lake at Monash) working on mountain stream benthos will shortly recover from their Surber sampler the most primitive calanoid copepod yet found and will present it to me for description. I suppose that apart from its primitive features I will just have to put up with the fact that it may have certain highly specialized features (e.g. the largest rostral sucker and/or the biggest prehensile hooks on the swimming feet ever found on a calanoid copepod!).

It is interesting that although the sands of the Queensland country are supposedly of fairly recent origin in terms of geological time, they provide habitat for some very primitive (or distinctive) animals both aquatic and terrestrial. The so-called "Cooloola monster", a cricket-like animal for which a new family of Orthoptera was erected in 1980 (this was the first addition to the Orthoptera at the family level for 75 years), occurs in the Cooloola sand mass and on Fraser Island (see ECOS No. 33, Spring 1982). Incidentally if anyone would like to read a very humorous and entertaining account of efforts made to capture this animal, then I heartily recommend Geoff Monteith's article "The Search for the 'Cooloola' Monster" which appeared in MOONBI No.42, pp. 8-9. If you don't know what MOONBI is, then its high time that you did! Subscription to it costs $6.00 per year.

Letters

FROM BRIAN BROCK, S.A.C.A.E..

Dear Dr. White,

At this campus , we are in the fortunate position of having the Torrens River flowing within fifty metres of the Science Block (closer when the floods are up). The river is a convenient source of great variety of aquatic invertebrates and plants, and also supports several vertebrate species (water-rats, tortoises, fish and birds, snakes, lizards). Apart from the usual run of text-book invertebrates, we are fortunate to find the two colonial organisms: Plumatella repens and a Cordylophora species.

I saw my first live Plumatella repens specimen on a microscope slide that had been left in the river in the course of settling experiments. Since then, we have seen it every year, on a variety of substrates. This year we have found it on trailing roots of Water Couch, on a gum stick dredged up during a "plankton" haul, and on the lower surface of rocks in a shallow flowing section of the river.

Plumatella and Cordylophora were both abundant in "our" stretch of the Torrens River in March and April this year. They are of particular interest because although both colonial, they have very different feeding mechanisms and gut-level organisation. Both have tentacles but those of Plumatella are covered with cilia, whereas those of Cordylophora bear stinging cells, as in Hydra or other Coelenterates. Cordylophora stings organisms like small crustaceans that come in contact with its tentacles and passes them into its gastro-vascular cavity. Water currents created by the beating cilia on the horse-shoe shaped tentacle bell of Plumatella cause food particles to accumulate near the mouth, at the base of the bell. Food particles are swept into the anterior end of the gut when it dilates suddenly. At the other end of the gut, neat faecal pellets are formed, and periodically excreted. The careful observer may witness both events.

The normal orientation of Plumatella colonies is such that faecal pellets fall away from the colony under the influence of gravity and may be swept further by currents. Colonies being observed in a laboratory situation are more likely to be orientated in such a way that voided faecal pellets accumulate on the surface of the colony. Intrepid "birdoes" and other habitual scat analysers in our ranks may immediately see a new source of revenue. The pellets may be collected with a Pasteur pipette and analysed for diatoms and other dainties under a compound microscope. Some pellets analysed on 20/4/83 were crammed with Euglena, apparently not digested and much of it still alive. Perhaps a reflection of prodigal feeding habits and short gut-passage time.

Cordylophora and Plumatella were kept alive in relatively simple laboratory systems for several weeks. Living Plumatella was observed on a T.V. screen by linking a video camera to a microscope. (Video cameras should not be mounted vertically). Feeding, tentacle flicking, defaecation and other behaviour could be discussed with the class using the T.V. image.

Using a video recorder, it would be fairly easy to obtain a tape for which an appropriate script could be written.

The resting (and dispersal) stages known as statoblasts are usually seen along disintegrating branches of old Plumatella repens colonies. In fact, the first I saw of Plumatella was a germinating statoblast on one of the microscope slides I was using in settling experiments.

A live Plumatella colony with horse-shoe shaped tentacle bells expanded is one of the most beautiful creatures I have seen under a microscope. I may be biased. I have heard a parasitologist in raptures about the beauty of a bright yellow tape-worm in a kangaroo's liver!

FROM J. WHARTON, DIRECTOR, VICTORIAN STATE CONSERVATION STRATEGY TASK FORCE

Dear Dr. Hart,

STATE CONSERVATION STRATEGY

As you know, the Victorian Government is developing a State Conservation Strategy. It is intended that the Strategy will provide guidance to all concerned with the use and management of the State's natural resources, both renewable and non-renewable.

One very important part of the process of developing the Conservation Strategy is to provide an oppurtunity for all interested groups and members of the public to make an input to it, and in order to do this, a Discussion Paper has been prepared. This paper proposes conservation objectives, examines the issues involved and considers the means for achieving conservation in Victoria. It is hoped that it will provide a useful basis for public comment and debate on the many issues involved. The Discussion paper is now being finalised and will be released in mid August. Any written or verbal comments you may care to make will be welcome until 18 November which is the closing date. All comments received will be considered in preparing the Conservation Strategy itself.

My purpose in writing is to forewarn you of the release of the Discussion Paper and thus allow more scope for its consideration between August and November. A copy of the Discussion Paper will be forwarded to you as soon as possible and you may be assured that any comments made will be much appreciated and will be taken into account in the formulation of the Conservation Strategy.

COMPLEXATION OF TRACE METALS IN NATURAL WATERS

An international symposium held at the Netherlands Institute for Sea Research (N.I.O.Z), Texel, the Netherlands in May 1983 heard fifty-two papers and poster presentations on the complexation of trace metals in natural waters. Papers were from all parts of the world, including North America, Asia, East and West Europe and Australia. The symposium was attended by some eighty-five scientists, demonstrating the growing interest in this area of environmental research.

The goal of the symposium was to evaluate the various analytical techniques and theoretical approaches concerning trace metal complexation in natural waters. In the ten or so years since the first papers on this topic were published, many different approaches have been made to solving the problem of understanding and quantifying trace metal complexation. It was therefore felt that it was an appropriate time to have an international symposium which would address the problem of unifying these approaches.

The topics of interest covered by the papers and posters included:

- inorganic and organic ligands involved in complexing trace metals
- interaction between trace metals and solid particles and colloids
- kinetics of the trace metal-ligand complexes formed
- biological responses to trace metal speciation
- modelling of the trace metal-ligand interaction
- analytical methods involved in measuring the complexing capacity of natural waters.

A number of papers from Australia were presented. These included a paper by B. T. Hart and M. J. Jones, from Chisholm Istitute of Technology, on the measurement of trace metal complexing capacity of Magelea Creek waters, one by T. M. Florence, from CSIRO, on the use of algae as indicators of copper speciation, and another by D. J. Mackey, also of CSIRO, on the investigation of metal-organic complexes in seawater using HPLC with atomic fluoresence.

The proceeding of the symposium will be published by Martinus Nijhoff/W. Junk Publishers, edited by C. J. M. Kramer and J. C. Duinker, and are expected to be available by May 1984.

M. J. Jones
Chisholm Institute of Technology

Study by Dr. K.G. McKenzie

Dr. K.G. McKenzie, D.Sc., F.Z.S, Riverina College of Advanced Education had a working visit to the Peoples Republic of China under the terms of the Scientific Exchange Agreement between the Australian Academy of Science and Academia Sinica. He spent about 3 weeks at the Institute of Geology and Palaeontology of Nanjing, and a day at the Institute of Geological Sciences, Beijing.

Dr. McKenzie's specialisation is in Cretaceous-Recent Ostracoda (Crustacea). He gave a series of lectures on this group of microfossils (widely used in the petroleum exploration as biostratigraphic and palaeoecologic indices) which were attended by workers from several petroleum and coal research institutes in China as well as by ostracod specialists. The best received lecture was that on "Functional Interpretation based on Characters of the Ostracod Carapace" especially as it related to more detailed correlated environmental interpretation. The research group from Shengli Oilfield (China's second largest) showed particular interest in this area.

Dr. McKenzie examined comparative material of Cretaceous-Recent age from all over China (Yunnan, Tibet, Xinjiang, Guizhou, Jiangsu, Bohai) representing recently completed or current research by the Nanjing Ostracoda group. He also studied briefly palaeozoic and early Mesozoic Ostracoda (Leperditicopida, Entomozoacea, Darwinulacea, "Thuringia" facies) at Nanjing; and Triassic-Cretaceous Darwinulacea, Cytheracea and Cypridacea of the Shanganxiang Basin, in the collections at the Institute of Geological Sciences, Beijing.

He also worked with the other Crustacea specialists at Nanjing (Bradoriida, Conchostraca, Notostraca, Kazacharthra, Pyllocarida, Eocarida) the highlight of this period being the oppurtunity to study for a whole day several beautifully preserved specimens of Kazacharthra (Triassic-Jurassic) a crustacean group with affinities to Notostraca and endemic to western China and Siberia.

The taxa reviewed briefly during his visit amounted to some 2000 species of Ostracoda and about 500 species of other Crustacea.

Important discussions were held with specialist colleagues at Nanjing on Cretaceous-Tertiary correlations between China and Australia and the other "provinces" of Tethys; also, on the proposal to publish (over 5 years) an "Atlas of Indopacific Ostracoda" in which 1500-1750 ostracode species (mainly Cretaceous-Cainozoic) would be described and figured.

The oppurtunity was taken to visit Beijing University and to have some ancillary discussions with representatives of the South China Agricultural College.

In his full report to the Australian Academy of Science (copy to Academia Sinica) Dr. McKenzie makes several recommendations concerning: future visits by Chinese Ostracoda and

other crustacean specialists to Australia (1984/5); a Chinese delegation to the "Shallow Tethys 2" conference being organised by him at Riverina C.A.E. for 1986; funding for the proposed "Atlas of Indopacific Ostracoda"; and his own return to China for another working visit in 1985.

Reviews

"Life in Inland Waters" by W.D. Williams. Blackwell Scientific Publications, Melbourne, Oxford. ISBN 0 86793 088 8. Recommended retail price: $15.95. 252pp.

Reviewed by Sam Lake

Like that workhorse of current Australian limnology courses Bayly & Williams' "Inland Waters and Their Ecology", this recent book by Professor Williams is distinctly Australian in emphasis and thus travels along the path of liberating Australian limnology from some of the over-bearing pressures of North American and European limnology. Possibly further along this path, someone, some day, will write a book on the limnology of arid environments and of unpredictable water bodies.

Professor Williams' book is descriptive rather than analytical in tone and is somewhat unconventional in its content. Some of the areas normally covered in books summarising limnology, such as zooplankton production, are dealt with very briefly. This brevity is compensated for by an emphasis on some aspects of limnology traditionally given only token mention. For example, there are replete chapters on amphibians and reptiles, water- birds and mammals. The latter chapter has a section complete with photograph assessing the validity of the bunyip - the author sides with the view that bunyips are/were seals with poor navigational skills and massive wanderlust.

The book opens with a brief introduction stating that the book's emphasis is on Australian inland water ecosystems. A chapter on "Lakes and other standing waters" precedes a chapter on "Rivers and streams". This latter chapter is basically a summary of what may be regarded as the various types of rivers occurring in Australia - a catagorisation not previously attempted. The much-mooted "River Continuum Concept" is outlined in this chapter and the question is asked in terms of Australian rivers "How applicable is the River Continuum hypothesis?". Beyond geographical concerns, others such as Rounick, Winterbourn, Barmuta and the reviewer are asking questions concerned with the applicablilty of such a deterministic, organismic concept as the R.C.C. to an understanding of the structure and function of such stochastic systems as rivers and their communities?

Chapter 4 deals with invertebrates to be followed by chapters on other denizens of inland waters - "Fish", "Amphibians and reptiles", "Waterbirds", "Mammals", "Microscopic plants" and "Macrophytes". While a treatment of such vertebrate groups as amphibians and reptiles is of interest to freshwater biologists not used to considering such adjuncts to freshwater ecosystems, such a treatment at the expense of such things as ecological processes does detract from the value of the book as a text book. However, this opinion must be tempered by the sad fact that in terms of the functioning of Australian inland aquatic ecosystems, we know very little indeed. Recently in response to an overseas request, the reviewer sought to find one example of a food web constructed for any Australian inland water body - constructed from observation, not conjecture. None could be found.

The last three chapters "Conservation", "The impact of man" and "Records from the past" are, to my mind, concise and well constructed summary statements on these three vital areas. The chapters on "Conservation", "Records from the past" and "Macrophytes" are the best in the book; with the latter two chapters dealing with areas that for too long have been neglected in standard limnology treatises.

The book is free of typographical and irritating errors of such ilk. There are some problems with the figures for, while the line drawings are good, some of the photographs are of dubious quality and illustrative value. For example, the photographs of the frogs (figs 6.1 and 6.2), the platypus (fig.8.1) and floating ferns (fig. 10.2) are too small, too dark and lack contrast. A significant plus for the book is the extensive bibliography which, given the scattered and sometimes obscure nature of papers in Australian limnology, is of very considerable time-saving value.

For a person entrapped in the web of limnology, this book is of interest on two counts - it deals with Australian inland waters, and it deals with matters normally only briefly mentioned in limnological treatises. While the book is largely descriptive it nevertheless is written in a lively style and may well lure vacillators into the web of limnology. For those teaching limnology the book is not a replacement of standard limnology textbooks (e.g. Bayly & Williams, Cole) but is rather an addition that interested students should be induced to read.

In the Introduction, Professor Williams correctly complains of the poor support that limnology has received in Australia. Indeed, given this Governmental neglect it is amazing that limnology is such a thriving branch of ecology in Australia. For how much longer will the cautious and miserly attitude to limnology by governments last? Hopefully not much longer, yet one cannot help being very sceptical about any improvement. For the fourth time in three years we have a national inquiry dealing with water research; presumably this time around it will not just be a case of more submissions under the bridge - this time the flood gates may release more than a trickle.

TEXTBOOK OF LIMNOLOGY: by Gerald A.Cole. The C.V. Mosby Company, St. Louis, U.S.A. Third Edition. 1983. Reviewed

The First edition of this book was greeted with considerable criticism and expressions of disappointment. One reviewer, if I remember rightly, felt that Cole's book was not the long-awaited replacement of Ruttner's sound but dated text book. I think that, in widening the coverage of subjects covered, Gerald Cole has in this Third edition of his book managed to meet substantially the criticisms levelled at the First edition.

The strengths of the book lie in the area of physico-chemical limnology rather than biological limnology, though the coverage of biological processes in freshwater ecosystems has been increased considerably in comparison with the first and second editions.

In the area of physico-chemical limnology the chapters on "Carbon Dioxide, Alkalinity, and pH - the CO_2 System" and "Oxygen and other Dissolved Gasses" are concise and well written accounts of subjects usually treated in fragments in other limnology text books.

A most welcome addition to this new edition is the new Chapter 7 "Streams - the Lotic Ecosystem". This chapter is a concise and cogent summary of the new ways in which the structure and functioning of stream communities are being examined. The chapter has the stamp of contemporaneity. For example, a three-page account is given of the "River Continuum Concept" (RCC) - a section which may conceivably have to be changed from edition to edition as the tenets of the R.C.C. are altered. For altered they will be!

While exposing the tenets of the R.C.C., Gerald Cole is wary of the "many trendy words" that have scampered into modern ecological literature. The author uses the verb to creep to describe this proliferation. Such wariness may be a sound approach; terms such as "resilience, stability, life history strategy, tactics, emergent properties" come to mind. Nevertheless, in any developing area of science the arisal of a jargon of "trendy" words occurs and may indicate a phase of rapid and revolutionary progress in the subject. It is only when an area of science has lost the impetus of there being rapid changes in ideas and that area becomes staid that the vocabulary becomes fixed and devoid of "trendy" words and "trendy" ideas. Possibly, in a textbook, the use of "trendy" words should be curtailed. However, in limnology at least a sense of what is going on in ecology may serve to inspire students to move beyond the boundaries of classical descriptive limnology.

While the book understandably concentrates on the North American limnology, it is pleasing to note that examples from Australian limnology figure quite strongly. The major example used in the context of "Faunal Destruction" is the inundation of Lake Pedder.

In comparison with the First and Second editions, the Third edition is a distinct improvement with increased amounts of figures and text, an impressive list of references and much improved index. The Third edition would serve as a useful reference book for courses in limnology and should be read by those launching into limnological research - especially the lentic variety.

LIMNOLOGY BIBLIOGRAPHY

The following is a list of titles or reprints received for the limnology bibliography for Australia or by Australian workers. For inclusion of references, please forward, titles, abstracts, reprints or citations to R. TAIT, C/- ESSO AUSTRALIA LTD., COAL & SYNTHETIC FUELS DEPARTMENT, P.O. BOX 4047, SYDNEY, 2001, N.S.W. To make this complete and worthwhile, everybody in ASL should contribute.

1982:

DeDeckker, P., Bauld, J., and Burne, R.V. Pillie Lake, Eyre Peninsula, South Australia: Modern environment, dolomite sedimentation and Holocene history. Roy. Soc. S.A. Trans. 106: 169-181

Ganf, G.G. Vertical separation of light and available nutrients as a factor causing replacement of green algae by blue-green algae in the plankton of a stratified lake. J. Ecol. 70: 829-844

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Arthington, A.H., Milton, D.A. and McKay, R.J. Effects of urban development and habitat alterations on the distribution and abundance of native and exotic freshwater fish in the Brisbane region, Queensland. Aust. J. Ecol. 8: 87-101.

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SOUTH AFRICAN CONFERENCE

The ASL has been invited to endorse a conference on Southern Hemisphere Limnology, to be held in South Africa in July 1984 (see Coming Events). The Conference is being organized through the South African Government's National Programme for Environmental Sciences in conjunction with the Limnological Society of Southern Africa. In view of the possibility that such an endorsement could be a controversial issue the executive is inviting comment from members who may have strong views either in favour of, or against ASL endorsement of the conference. Comments should be sent to Barry Hart at the address inside the front cover as soon as possible.

INTERIM COUNCIL - INSTITUTE OF FRESHWATER STUDIES

The Interim Council's terms of reference are:

To advise whether an Institute of Freshwater Studies should be established:

- to investigate water quality; and
- to specifically advise on the equitable and effective management of the Murray-Darling Basin as a national resources.

If such an Institute is recommended, the Interim Council is to advise on:

- the functions and modus operandi of the Institute;
- the constitution of the Council;
- the location of the Institute;
- the relationships of such an Institute to:
  - (i) Commonwealth-funded water research agencies including CSIRO, Bureau of Mineral Resources, Australian Atomic Energy Commission, Bureau of Meteorology and tertiary education institutions;
  - (ii) the National Water Research Council;
  - (iii) State Government water research agencies;
  - (iv) the River Murray Commission; and
  - (v) the Alligator Rivers Region Research Institute
- estimates of capital and recurrent costs.

In making recommendations with respect to the functions of the Institute, the Interim Council will advise me on the need for:

-information and research necessary to provide for the efficient management of interstate river systems, with particular reference to the River Murray and its tributaries;

-information and research in relation to the biological, environmental, economic, social and physical aspects of freshwater science; and

-development of appropriate technology for the efficient use of water resources.

The Interim Council will make whatever enquiries it deems necessary for the purpose of carrying out its task, and public submissions have already been invited.
The membership of the Interim Council is:

Professor J.P. Quirk, Director of the Waite Agricultural Research Institute, University of Adelaide, Chairman of the Council;

Professor N.F. Millis, Professor of Microbiology, University of Melbourne;

Dr. R.J. Millington, Chief of CSIRO Division of Water and Land Rsources;

Mr. B.D. Scarsbrick, New South Wales Department of Agriculture and Fisheries, Regional Director for the Murray and Riverina Region;

Mr. K.J. Shepherd, Director of Water Resources, Ministry of Water Resources and Water Supply, Victoria;

Dr. D.W. Connell, Reader in Environmental Chemistry, Griffith University; and

Dr. B.R. Davidson, Senior Lecturer in Agricultural Economics, University of Sydney.

LIMNOLOGISTS- GET YOUR FEET WET!

Last January John Blyth and Luisa Macmillan organised a very successful two weeks of bush walking along (or in) streams on the Errinundra Plateau in East Gippsland (Victoria's answer to South West Tasmania). Not only was this good fun (?) and in magnificent rainforest, it actually produced some interesting results. Luisa gained far more information for her project on the conservation status of Victoria's rivers than she could ever hope to on her own and John collected a lot of basic data for comparison of logged and unlogged streams in the area. Slides taken on these walks were shown at the ASL meeting at Brisbane.

Next January it is proposed to carry out a similar survey in the Rodger River area of East Gippsland. This area has not been logged but the Forest Commission is hoping to move in before the end of the year. Volunteers are wanted to help by walking along these streams. You have to provide your own gear but it should be well worth the time. The walks will be one or several days, depending on how fit you feel. Walks will be in groups of four people with at least two experienced walkers in each group so we dont intend losing many people (we didn't lose any last year unfortunately). The walks will be held in the first and last weeks of January (31.12.83 - 7.1.84 and 22.1.84 - 29.1.84). If you are interested contact Peter Lillywhite at the Museum of Victoria, 71 Victoria Cresent, Abbotsford, 3067, ph. 419 5200 BH.

ASL 1984 CONGRESS

Initial preparation for the 1984 ASL Congress, to be held in Mt Gambier, Sth Australia, are now well advanced. The conference theme will be " Water Quality Research in Australia ". It is intended to invite 2 or 3 keynote speakers.

Dr. Phil Suter from the Engineering and Water Supply Department in Adelaide has accepted responsibility for conference organization. The format will be similar to previous years :

Friday 18 May 1984	: Registration
Saturday 19 May	: Scientific Programme
	Keynote Session
	Presented Papers
	Conference Dinner
Sunday 20 May	: Presented Papers
	Annual General Meeting
	Evening BBQ at Brands Winery
Monday 21 May	: Field Trip to Blue Lake, Ewen's Ponds etc.

We are presently negotiating with East-West Airlines to arrange special flights to Mt Gambier on Friday afternoon and Monday afternoon. For wine buffs we hope to offer at reasonable prices a special bottling of white and red wines.

Put the conference dates in your diary now - it will be well worth attending. Full registration details and a call for papers are expected to be made in March 1984.

Coming Events

21 to 22 December 1983

Winter Annual General Meeting, British Ecological Society.

Venue : University of Leicester

Sessions proposed include : Feeding and foraging by aquatic animals, tropical limnology, ecophysiology of aquatic organisms, river community structure.

6 to 10 February 1984

AWWA Fifth Summer School

Venue : Canberra CAE

Theme : Methods of water management : 1984 and beyond.

Details : School of Applied Science, Canberra CAE , PO Box 1 , Belconnen ACT 2616.

20 to 24 February 1984

Municipal Water Treatment Course

Venue : University of NSW

Details : Mr P. Bliss , School of Civil Engineering , UNSW , PO Box 1 , Kensington , NSW 2033.

14 to 18 May 1984

54th ANZAAS Congress

Venue : Canberra

Details : ANZAAS , PO Box 873 , Sydney 2000.

18 to 21 May 1984

ASL Annual Congress

Venue : Mt Gambier, Sth Australia.

Details : Mrs M. Hart , 22 Netherby Ave , Mulgrave 3170.

10 to 12 June 1984

Water Quality Evolution Within the Hydrological Cycle of Watersheds.

Venue : Quebec, Canada.

Details : H. Whiteley , CHS:84 Program Chairman, School of Engineering, University of Guelph , Guelph , Ontario N1G 2W1 , Canada.

2 to 6 July 1984

Municipal Wastewater Treatment Course

Venue : University of NSW

Details : Professional Education Office, School of Civil Engineering, UNSW , PO Box 1 , Kensington 2033.

3 to 13 July 1984

Perspectives in Southern Hemisphere Limnology

Venue : Wilderness, South Africa.

Details : Ecosystem Programmes, CSP, CSIRO, PO Box 395, Pretoria 0001, South Africa.

13 to 17 August 1984

Fourth International Conference on Mediterranean Ecosystems.

Venue : University of Western Australia

Theme : Resilience in Mediterranean Ecosystems

Details : MEDECOS , Botany Dept , University of Western Australia, Nedlands, W.A. 6009.

13 to 17 August 1984

Second International Conference on Copepoda

Venue : Ottawa, Canada

Details : The Secretariat, International Conference on Copepoda, University of Ottawa, 648 King Edward Avenue, Ottawa, Ontario, Canada K1N 6N5.

20 to 26 August 1984

17th International Congress of Entomology

Venue : Hamburg, Germany

Details : Dr T. Tischler, Zoologisches Institut, Universitat Kiel, Olshausenstr. 40/60 D-2300 Kiel 1 , Federal Republic of Germany.

23 to 24 August 1984

The Ecology of Biological Invasions

Venue : Canberra

Details : Australian Academy of Sciences

28 to 29 August 1984

Ecological Society of Australia Meeting

Venue : Sydney

Theme : Are Australian Ecosystems Different ?

Details : Dr M. Westoby, Biology Dept , Macquarie University, North Ryde, NSW 2113.

Thesis Abstracts

FIELD AND EXPERIMENTAL STUDIES ON THE BIOLOGY OF SULCANUS CONFLICTUS NICHOLLS (COPOPODA : CALANOIDA). Keely Ough, B.Sc. Honours Thesis, Zoology Department, Monash University, 1982.

Three essential discrete populations of Sulcanus conflictus were studied, with particular emphasis on the effects of temperature, which varied considerably throughout the study. Other physico-chemical factors monitored throughout the study remained relatively stable. Chlorophyll-a concentration were consistently low in all lakes.

Probit analysis gave upper and lower 48 hour -LC_{50} values for salinity of 33.8 and 1.7ppt at 10°C, and 27.2 and 1.5ppt at 18°C.

Sulcanus was reared through a complete life cycle under fixed conditions of temperature (10, 18 and 25°C). The results are similar to those of other workers and show that embryonic and post-embryonic development of Sulcanus are strongly temperature dependent. This is further supported by field observations.

Both laboratory and field data support the hypothesis that the body size of adult Sulcanus is a function of temperature during growth, with greatest body sizes being reached at low temperatures.

All copepodite stages underwent diurnal vertical migrations, although adults were seen to participate to a greater extent than immature copepodites.

Significantly higher predation rates were observed on Gladioferens nauplii than conspecific nauplii. After metamorphosis to the copepodite, susceptibility to predation by Sulcanus was decreased.

STUDIES ON THE BIOLOGY OF DINOTOPERLA SPECIES (PLECOPTERA : GRIPOPTERYGIDAE) IN VICTORIA. Catherine M. Yule. M.Sc. Thesis, Zoology Department, Monash University, 1982.

The taxonomy and ecology of species of Dinotoperla (Gripopterygidae) in Victoria was studied over a period of three years. Revised descriptions of seven species of Dinotoperla are given. D. thwaitesi is recognised as a distinct species and is therefore resurrected from synonomy with D. serricauda. The female of D. fontana is described for the first time as such (the paratype female originally described was, in fact, a specimen of D. thwaitesi). The eggs of seven species are described.

Species of Dinotoperla are clearly distinguishable on the basis of adult genitalia (particularly the configuration of the male epiproct as seen under the light microscope), and also the external morphology of the eggs (visible under the scanning electron microscope).

A comparative study of the life histories of six species of Dinotoperla was undertaken. On of these, D. bassae occurred only in temporary pools, three species, D. thwaitesi, D. fontana and D. brevipennis, were found in intermittently flowing creeks, while these three species as well as D. eucumbene and D. christinae inhabited cool, permanent rivers. Aspects of their life history studied included the timing of the incubation periods of the eggs, hatching, nymphal development and emergence (ecdysis in the adult stage), and also nymphal instars, mating, oviposition and dietary habits.

All the species were found to be univoltine (except for D. eucumbene which had a nymphal life span of 11 to 15 months). All except for D. thwaitesi and D. fontana had seasonal well-synchronised life cycles. Emergence periods of all species were relatively restricted, and were completed by early summer.

Some commonly followed methods of instar discrimmination were used and evaluated. Of these the most effective were found to be the use of size frequency histograms, rearing data and wing pad morphology. D. bassae apparently underwent 7 instars, and the nymphs of the other species went through 8 or 9 instars.

All the species were herbivore-detritivores, however, differences were observed in the nutritional quality of the diets. The nymphs of the largest, fastest growing species, D. bassae, consumed the highest quality diet (largely green algae and diatoms) while the smallest species (D. brevipennis) and the slowest growing species (D. eucumbene) both had the poorest diets (consisting mostly of detritus).

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